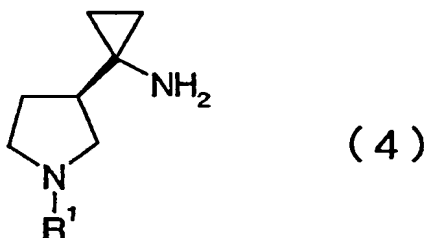


Claims

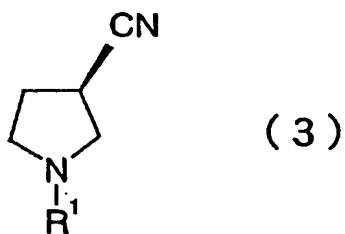
1. A process for producing an optically active compound represented by formula (4):

[F2]



wherein R¹ represents a protecting group for the amino group, or a salt thereof, characterized in that a reagent prepared from an titanium(IV) reagent and an alkylmetal compound is reacted with an optically active compound represented by formula (3):

[F1]



wherein R¹ has the same meaning as defined above, optionally in the presence of a Lewis acid.

2. The process according to claim 1, wherein the titanium(IV) reagent is a titanium(IV) alkoxide.

3. The process according to claim 1, wherein the titanium(IV) reagent is titanium(IV) tetraisopropoxide, methyltitanium(IV) triisopropoxide, or chlorotitanium(IV)

triisopropoxide.

4. The process according to any one of claims 1 to 3, wherein the alkylmetal compound is an ethylmetal compound.

5. The process according to any one of claims 1 to 3, wherein the alkylmetal compound is an alkyl Grignard reagent or a dialkylzinc.

6. The process according to claim 5, wherein the alkyl Grignard reagent is an ethyl Grignard reagent.

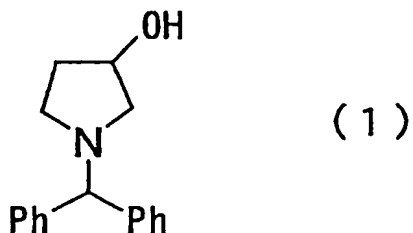
7. The process according to claim 6, wherein the ethyl Grignard reagent is ethylmagnesium chloride or ethylmagnesium bromide.

8. The process according to claim 7, wherein the ethyl Grignard reagent is ethylmagnesium bromide.

9. The process according to any one of claims 1 to 3, wherein the alkylmetal compound is diethylzinc.

10. A compound represented by formula (1):

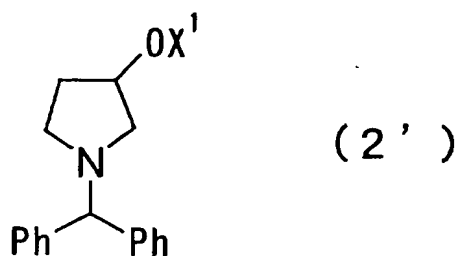
[F3]



or an optically active species thereof.

11. A compound represented by formula (2'):

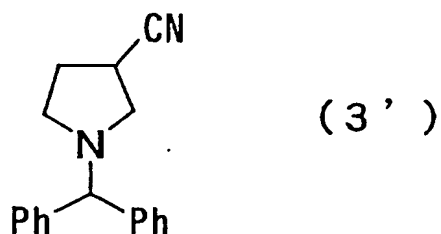
[F4]



wherein X¹ represents a methanesulfonyl group or a p-toluenesulfonyl group, or an optically active species thereof.

12. A compound represented by formula (3'):

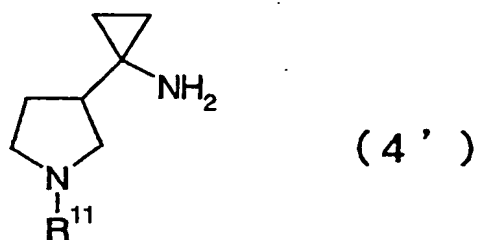
[F5]



or an optically active species thereof.

13. A compound represented by formula (4'):

[F6]

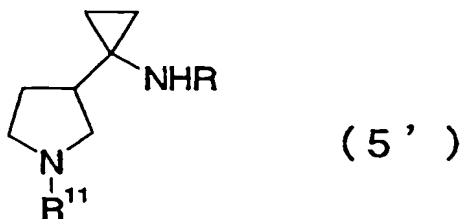


wherein R¹¹ represents a benzyl group, a phenethyl group, a benzyloxycarbonyl group, a methoxyphenyl group, a diphenylmethyl group or a trityl group, or an optically active species thereof, or a salt of the compound or the

species.

14. A compound represented by formula (5'):

[F7]



wherein R¹¹ represents a benzyl group, a phenethyl group, a benzyloxycarbonyl group, a methoxyphenyl group, a diphenylmethyl group or a trityl group, and R represents a protecting group for the amino group, or an optically active species thereof.

15. A compound represented by formula (7).

[F8]

